WATER AND SEWAGE SURVEY

TOWN OF NICKEL CENTRE

WAHNAPITAE EAST

1983

Ministry
of the
Environment

Ontario

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Prepared by:

Ministry of the Environment,
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1.0 SUMMARY

At the request of the Nickel Centre Town Council and the Regional Municipality of Sudbury/Ministry of the Environment Liaison Committee, a survey of water and sewage systems was conducted along Highway 17 East, in the developed area located east of Wahnapitae, to the easterly town boundaries. This report discusses the results of this 1981-82 survey.

Of the 107 residences occupied at the time of the study, 106 were surveyed. Results of bacteriological and chemical analyses were provided to the residents.

The following is a summary of the findings divided into health, aesthetic, and quantity considerations.

1.1 Health

1) Malfunctioning sewage systems - 9 problems were reported. The lack of problems is considered to be in large part due to the insufficient supply of water. Sewage disposal will not normally be a problem if water is not available. Should a plentiful water supply be provided, it is anticipated that a much larger number of sewage disposal problems will arise.

2) A total of 24 water supplies were bacterially contaminated at the time of the survey. Two of these supplies served several homes resulting in 38 homes being affected by bacterially contaminated water.

3) Three supplies were found to have nitrates, in excess of the recommended level of 10 mg/L. Twelve other supplies showed lower levels of contamination ie. between 3 and 10 mg/L. High nitrate concentrations in subsurface water are often indicative of long term accumulation of pollution to the water table. Excessive nitrates are not considered to be toxic to adults or children over 3 months. Long term consumption of highly contaminated nitrate water can result in methemoglobenimia in infants of 3 months or less.

1.2 Aesthetics

Seventy-five percent of supplies had highly coloured water, while iron and manganese were above Ministry criteria in 36% and 41% of supplies respectively. Water turbidity was above the objective in 63% of supplies.

Nine supplies were found to have elevated levels of chlorides.

1.3 Quantity

Many residents (~24%) expressed complaints of low water supply. Many of the supplies low in quantity were also contaminated by other health and/or aesthetic related parameters.

Dug wells were most often found to have both quantity and quality related deficiencies. It appears that the most desirable method of correction, in these cases, would be newly drilled wells.

The survey revealed a number of health related water supply problems within the general study area. The frequency of bacterially contaminated supplies was high. Both aesthetic and quantity problems were prevalent. The lack of an abundant supply of water, for many households, was a factor which contributed to the low frequency of sewage disposal related deficiencies.

Based on the above-noted results and the probability of increased water supplies in the area creating sewage related problems, it would appear that the Wahnapitae East area may have a situation eligible for assistance under the Ministry of the Environment's Small Systems Alternative (Private Service Funding) Grant Program.

Correction of water quality and quantity problems through the installation of new drilled wells or the disinfection of surface supplies, as well as, upgrading deficient sewage disposal systems would be eligible; if the area is accepted for this Ministry of the Environment grant program.

2.0 RECOMMENDATIONS

1. All surface water supplies should be treated, including disinfection. Communal surface supplies should be upgraded to comply with Ministry of the Environment standards.

2. Dug wells which showed quantitative and/or health related qualitative water problems should be corrected. The most desirable method of correction appears to be the drilling of new wells.

3. The area should be considered for assistance, through the M.O.E. Small Systems Alternative Grant program, for the correction of health and quantity related water supply problems and upgrading of sewage disposal systems where warranted.

3.0 INTRODUCTION

A sanitary survey of the Wahnapitae East area was undertaken, in the latter part of the summer of 1981 and early in the summer of 1982, by the Sudbury District Abatement Section of the Ministry of the Environment. The Ministry carried out the survey in response to a request by the Council of the Town of Nickel Centre, to the Ministry, through the Regional Municipality of Sudbury. Its purpose was to assess water supply and sewage disposal systems, to determine if the area had problems of sufficient severity and number to be eligible for assistance, through the Ministry of the Environment Small System Alternative Grant Program.

For the purpose of this survey, the area boundaries were determined in consultation with the municipality. The area includes development along Highway 17 East, beginning at Wahnapitae Lumber, approximately 1.5 km from the serviced area of the Town of Wahnapitae. It extended to the easterly boundary of the Regional Municipality of Sudbury.

The survey area included off-highway development on: Mill Road, Beaudry Road, Norvic Drive, Joudrey Drive, Spencer Road, and the Stinson Hydro Road. The area consisted of residential and commercial establishments and one trailer park, with a total area population slightly in excess of 400.

Development of this community took place over several years and is approximately 20 years old. The nearest development is 1.5 km from the serviced area of Wahnapitae and the homes are thus on private sewer and water supplies.

A plan of the area is shown in Appendix A. The study boundaries include the entire geographical area west of Wahnapitae. However, community boundaries applicable for Ministry grant programs may be different.

3.1 Topography and Drainage

The survey area is located on the edge of the Wahnapitae River valley drainage area. The highway is on the fringe of a transition zone between minor southerly flowing watersheds and the north flowing watershed to the Wahnapitae River.

The south side of the highway is predominantly rolling, bare rock, devoid of vegetation and surficial deposits. Some ground cover is however, present in the valleys.

The north side of the highway is almost entirely within the Wahnapitae River valley and is flatter with a gradual northerly slope towards the Wahnapitae River. There are generally more surficial deposits in this area which are in the form of silt and clays.

Drainage is predominantly from the south to the north, towards the Wahnapitae River. Ditching along both the highway and the railway controls and directs drainage. The railroad causes a break in the drainage patterns creating swampy areas for a distance of approximately 1 km along the south side of the railway.

There is no permanent stream draining the area, although there are many intermittent watercourses.

3.2 Survey Procedures

Due to the lateness of the request and the size of the survey area, the survey was phased over a two year period.

The field work began late in July, and continued to the end of August 1981. The second phase of the survey was undertaken in May of 1982 and terminated in July of the same year.

The survey field work consisted of the following procedures.

1. A plan of the area was developed to catalogue every residence.

2. At each home a questionnaire form was completed, with the aid of the owner or tenant. If no one was home at the time of the visit, a letter was delivered asking the resident to arrange for an appropriate meeting time (see Appendix B).

3. At the time of the interview, the water supplies were sampled for bacteriological and chemical analyses. Bacteriological samples were forwarded to the Sudbury Ministry of Health Laboratory for coliform examination. Chemical samples were sent to the M.O.E. Laboratory in Toronto. The chemical parameters for which analyses were requested were: hardness, alkalinity, iron chloride, pH, colour, turbidity, nitrate, sodium, fluoride, conductivity, manganese, sulphate and on occasion the metals group of copper, nickel, zinc, lead, cadmium and arsenic.

4. An inspection of the property was undertaken to determine the locations of the septic system and water supply. A search for evidence of malfunctioning sewage systems was also conducted.

5. A sketch of the lot was drawn to reflect the findings of the inspection.

Bacteriological results in excess of Ministry of Health criteria (<2 total, 0 fecal coliform) were reported to the occupant without delay. Depending on the level of contamination, either a second sample was taken to verify the results, or the occupants were advised to boil their water before consumption and disinfect their well. Once the well had been disinfected, it was suggested that another sample be taken to determine the effectiveness of the treatment.

Ditch samples for bacteriological analyses were also taken throughout the survey area. Ditch sampling locations are shown in Appendix A.

A total of 106 establishments were surveyed of the 107 which were found to be occupied at the time of the survey, and within the established boundaries. The occupants of one residence were not reached and 5 establishments were found to be vacant at the time of the survey.

A list of the occupants/owners is provided in Appendix C and their locations are shown in Appendix A.

4.0 QUESTIONNAIRE RESULTS

4.1 Sewage Disposal Systems

Appendix D summarizes the types and age classes of the sewage disposal systems, as reported in interviews with the residents.

Ninety-seven establishments (92%) utilized septic tanks and leaching beds (Class 4 systems). Two of these systems were shared by two residences. Holding tanks (Class 5 systems) were installed in only four cases (~4%) while 2 establishments had outhouses (Class 1 systems). One occupant was unaware of the type of sewage disposal system which served the residence.

Thirteen percent of the Class 4 systems were less than 5 years old, while thirty-nine percent were in excess of 10 years old. Twenty-six percent of the systems were of steel construction and within the aforementioned age group.

At the time of the survey, 9 systems were found or reported to have problems. The particulars of these problems were as follows:

1) The residents complained of frequent blockage of external piping, requiring excessive maintenance problems.

2) One resident shared a sewage system with another residence, thus overloading the system. Further, the cover of the septic tank was not to specifications and some neighbors complained of odours eminating from this source.

3) One residence had a system which was 27 years old, and the tank was of steel construction, and thought to be corroded.

4) Odour was detected at one home, although no other outward physical evidence of malfunction was found.

5) Two residents reported ponding of sewage on the surface of the ground in the spring. Evidence of this malfunction was not observed during the inspection.

6) One resident reported that ponding of sewage would occur under conditions of high water usage.

7) One system was suspected to be illegal, in that no field bed was apparent.

8) One resident reported to have a holding tank which had not been pumped out recently, and which showed signs of emanating sewage to the environment.

In addition, grey water was discharged to the ground surface in 19 instances, while 6 homes used leaching pits to dispose of this waste.

Regulations require that grey water be discharged to an acceptable sewage system and not to ground surface or leaching pits.

4.2 Water Supplies

The types and ages of the water systems utilized in this area, are listed in Appendix E.

The majority of water supplies were dug wells (56%) while drilled wells were also used extensively (34%). The surface waters of the nearby Wahnapitae River supplied 8% of the residences. Only one residence was connected to a well point and one supply was of an undetermined construction. Five systems were shared.

The average depth of dug wells was 6.7 m, with 50% of the wells being over 10 years old. Many of these wells yielded a poor water quantity thus forcing 5 owners to dig or drill a second well to supply their needs.

The average depth of drilled wells was 45 m. Over half of the drilled wells (53%) were over 10 years old.

The eight residences supplied by river water, belong to a co-operative communal water system. The majority of the residents interviewed, indicated that they converted from dug wells to the river supply because their wells did not yield a sufficient quantity of water, for normal household usage. None of the residences supplied by surface water were equipped with disinfection units, as required by M.O.E. regulations.

Appendix F summarizes questionnaire results relating to water supplies. Of the 106 residents surveyed, 75% rated their water as good to excellent, while 25% rated the quality as fair to poor. The particular water quality complaints in order of frequency were: hardness and iron (37%), odour (14%), taste (12%) and colour (11%). Two residents did not drink their water due to the severity of one or more of the above-noted problems.

Water shortages of varying degrees were reported as a problem by (25) 24% of the residents. Supplies could not meet the required normal household usage, on a regular basis, during the summer and on occasion during the winter. This regular quantity problem was termed a severe shortage. The residents of other homes carefully managed their water supply, with 8 supplies falling short of the required needs during dry summers. In this context, careful water management referred to washing clothing at laundromats,

avoiding peak usage periods and generally reduced use in washrooms. Water shortages also led to the sharing of a supply in 5 situations within the survey area.

In summary, 25% of the supplies were reported to have aesthetic problems, while 24% of the wells in the survey area could not supply sufficient quantities of water on a regular basis, even though careful water management practices were followed.

SAMPLE ANALYSIS RESULTS

5.1 Bacteriological Quality

Bacteriological analysis of drinking water indicated that 22 (21%) supplies had coliform counts above the Ministry of Health criteria of: <2 total coliform and 0 fecal coliform. All but 4 of the supplies had fecal coliform, as well as total coliform counts.

Each resident was contacted immediately regarding the contamination of their well and was advised to boil all drinking water, until disinfection of the supply was undertaken. The Sudbury and District Health Unit was informed of all contaminated supplies.

Results of ditch sampling did not reveal excessive levels of bacterial contamination.

5.2 Physical/Chemical Quality

Appendix G summarizes the physical/chemical results of the sampling program.

The results indicate, that only 3% of the wells contained nitrates in excess of M.O.E. Drinking Water Criterion of 10 mg/L, while 41% contained sodium in excess of the notification levels of 20 mg/L.

Iron and manganese guidelines were exceeded in 36% and 41% of supplies, respectively.

In general, water supplies were coloured and turbid, as M.O.E. Drinking Water Quality criteria, for these parameters, were exceeded in 71% and 63% of supplies respectively. Only 4% of supplies were not within Ministry guidelines for pH.

The level of chlorides was found in concentrations exceeding the Ministry's criterion in 9 supplies.

In addition, the samples collected for metal analysis did not reveal excessive concentration of any of the following metals: copper, lead, cadmium, zinc and arsenic. There is no drinking water criterion for nickel.

6.0 DISCUSSION

The sanitary survey, conducted in the summers of 1981 and 1982, revealed few actual health or environmental problems with sewage disposal systems. However, many water supplies in the area were plagued by water shortages and bacterial contamination.

6.1 Sewage Disposal Systems

In general, subsurface sewage disposal systems appeared to be functioning satisfactorily, at the time of the survey. However, the Sudbury and District Health Unit has indicated that it receives a number of complaints from this area each year. Thus, it is important to realize that there are temporal and methodological constraints on any survey.

A faulty sewage system cannot be detected if there are no external physical indications of such, at the time of the survey. Therefore, it is possible that some systems, which were not detected as problematic during the survey, could cause problems at some other time. If this does occur, the residents or neighbors should report the malfunction to the Sudbury and District Health Unit, the authority responsible for enforcement of sewage disposal regulations in the Sudbury area.

From the survey, two systems were found to experience blockages and odour problems, one was considered to be overloaded and did not have an effective cover. Three other systems were reported to experience ponding of sewage on the surface of the tile bed, during the spring, and/or under conditions of increased usage. One system did not appear to conform to standards, as it had only a very minimal tile bed. A final system was considered to be corroded owing to its advanced age (27 years), steel construction and the owners suspicions.

All of the above-noted identifiable problems were reported to the Sudbury and District Health Unit.

A total of 19 cases were found to have illegal grey water (sink and laundry wastes) discharges to the ground surface, either directly or through the outlet of sump pumps. As well, 6 residents employed leaching pits for grey water disposal. Although no health hazards appeared to result from these methods of grey water disposal, regulations require that all grey water be disposed of in an acceptable sewage system.

A complicating factor in the assessment of the suitability of sewage disposal systems, is the lack of a plentiful water supply at many of the residences in the area. If the 10 residents who presently do not use their domestic laundry

facilities, because of water shortage, gain an adequate supply, an increase in water consumption is anticipated and could potentially create new sewage disposal problems. In addition, once the 25 residents, who presently dispose of grey water to the ground or leaching beds, connect their full plumbing system to their septic system, this too would increase the potential for sewage disposal problems.

Thus, considering the age and poor location of many of the systems, there is potential for an additional 35 sewage disposal problems. This estimate does not account for the probable increased usage of water in other homes, which could possibly become eligible for improvements to their water supplies, should this program come into effect.

Thus, the survey revealed that most dwellings appeared to have satisfactory sewage disposal systems. This is not to say that the systems are operating optimumly, since many systems are old, 40% being greater than 10 years old and the lot sizes are small, with minimal surficial deposits. The area is plagued by many rock outcrops, limiting the available land area for the placement of new Class 4 sewage systems. When the existing systems become inadequate, some of the septic tanks and field beds may thus have to be replaced by holding tanks.

6.2 Water Supplies

6.2.1 Bacteriological Quality

It was revealed that 22 supplies were bacterially contaminated at the time of the survey. In addition and subsequent to this survey, the Sudbury and District Health Unit conducted routine bacterial sampling of communal water systems in the Wahnapitae area. Two communal supplies were found to be bacterially contaminated at that time. The Dempsey Road cooperative surface water supply serving 8 residences, and the Larocque Trailer Park supply, a dug well, serving 7 trailers at the time of the study, were both put under a "Boil Water" Order by the Health Unit. Therefore, the total number of bacterially contaminated supplies came to 24, affecting a total of 38 residences.

Of the bacterially contaminated supplies, 15 were dug wells, 7 were drilled wells, 1 was the Dempsey Co-operative, and the last was a well of unknown construction.

The presence of coliform bacteria indicates contamination by sewage and surface runoff. Fecal coliform bacteria are only found in the intestinal contents of warm blooded animals and their presence is considered to be an indication of sewage contamination. In most cases, the only sewage source, in close proximity to the wells, is a poorly functioning private sewage disposal system.

Contaminated dug wells, in the survey area, were located on average, only 12m from their respective sewage disposal systems. This factor, combined with poor soil conditions, the shallow average depth of dug wells (7m), and the large percentage of older sewage disposal systems, lends further evidence to support the source of contamination to be private sewage disposal systems.

The 7 drilled wells, which experienced bacterial contamination, are also most likely receiving surface water or water originating from contaminated shallow aquifers. This contamination would enter drilled wells through faulty well seals, connecting rock fissures and/or improper well construction.

In 2 of the cases of drilled wells with marginal bacterial contamination (levels of total coliform and fecal coliform of 2/1 respectively), sampling and/or laboratory error was suspected. Additional sampling of one of these wells showed no problems.

Surface waters are open to contamination by humans, animals and birds, all of which are potential vectors of disease. Therefore, Ministry policy is that no surface water be considered safe for human consumption, without prior treatment, including disinfection. Depending on the initial quality of surface water, pretreatment (by filtration) may

be necessary before disinfection. None of the residents, supplied by surface waters, had disinfection equipment installed as part of their system. The recommended solution is installing a chlorinator or ultraviolet light disinfection equipment.

If bacteria are the only contaminant to a well, the installation of a disinfection unit should be considered. However, relocation of dug wells, to a distance not less than 30m from all private sewage disposal systems, is the preferred method of alleviating bacterial contamination. Many of the lots are small, having a large area of rock outcrops, thus reducing the allowable area for the relocation of a dug well. If this case is predominant, then a newly drilled well, cased to a minimum of 7m and located 15 or more metres from sewage disposal systems, should be considered.

Bacterial contamination of drilled wells can be alleviated by resealing casings, drilling new wells, or installing disinfection equipment (ie. chlorinator or ultraviolet light devices).

6.2.2 Physical/Chemical Quality

In addition to the 3 wells found to exhibit nitrate levels in excess of the M.O.E. Drinking Water Quality criterion, an additional 12 wells had levels of nitrate at or above 3 mg/L. According to the Supporting Document to the Guidelines for Canadian Drinking Water Quality, 1978, the average Canadian drinking water nitrate level is 1 mg/L. Table 1 below, provides a more detailed summary of the occurrence of nitrates in wells of the Wahnapitae area. This information is provided because nitrates can vary substantially from season to season, and year to year, and gives an indication of the extent of nitrate contamination in the area.

Table 1: Distribution of Nitrate Contamination

	Range of Nitrate Concentrations (mg/L)			
	1.0 - 2.9	3.0 - 5.9	6.0 - 9.9	10+
No. of Wells in Each Range	16	10	2	3
% of Dug Wells	67	60	100	100
% of Drilled Wells	30	40	-	-
% of Unknown Construction	3	-	-	-

The maximum allowable concentration for nitrates, of 10 mg/L, is based on evidence of a relationship between significantly elevated levels and the occurrence of an oxygen starved condition, in infants of 3 months or less. This is known as infantile methemeglobenimia. Older children and adults are more tolerant to nitrates.

Nitrate is an essential nutrient for plants; it is found naturally in normal soils and groundwater. Elevated levels of nitrate in groundwater however, can be the result of contamination by fertilization, the disposal of animal wastes, or by wastewater disposal systems, such as from septic tank and field bed effluents.

Nitrates can reach wells from subsurface sewage disposal systems, because as field beds become older, their capacity to process septic tank effluent becomes reduced. The effluent passes through the saturated soil and enters the thin soil mantle of the area. It thus reaches shallow aquifers which may be connected to shallow wells or poorly sealed drilled wells. This method of contamination appears to exist in the area, since 52% of bacterially contaminated wells also showed some above background nitrate levels.

The solution to this well problem would be similar to that mentioned for bacterially contaminated supplies. All dug wells should be relocated to at least 30m from sewage disposal systems. If this is not possible, due to the size of the lot and/or the placement of the house or septic system, then drilled wells cased and sealed to a depth of 7m should be considered.

Drilled wells experiencing nitrate contamination should be resealed or redrilled to a deeper depth or the location should be changed, to conform with Ministry regulations.

A third remedial option for nitrate contamination is to install reverse osmosis or distillation units. This type of water treatment may be less desirable, since the units are relatively expensive, require on-going owner maintenance and supply only enough water for drinking purposes.

Of the 42 wells found to have sodium concentrations above the Ministry's 20 mg/L notification level, thirty-one were dug wells and 11 were drilled wells. The water supplies having the highest sodium levels (97-200 mg/l) were dug wells, located along the north side of a 0.6 km stretch of the highway. All of these wells were placed downgradient of the highway and within approximately 20m of it. The wells also showed correspondingly high levels of chlorides. The 9 supplies where chlorides exceeded 250 mg/L were located in

this same area. The three factors of location, elevated sodium and chloride, implicate highway winter road maintenance as the probable source of contamination. Further investigation is required to confirm this relationship, and will be done if requested.

There is no maximum recommended limits in the Ministry of the Environment's "Drinking Water Objectives" for sodium. However, high sodium concentrations can have an adverse effect on people already suffering from cardiac, renal and circulatory problems. Therefore, the local Medical Officer of Health is notified of all supplies having sodium levels of 20 mg/L or more. In addition, the residents concerned were notified of the water analysis results. They were further advised to consult their family doctor, if they required information regarding the health implications of consuming water with sodium concentrations above 20 mg/L.

Table 2 below provides a summary of the occurrence of levels above Ministry recommended limits for aesthetic parameters, and what the potential problems are for each parameter. Aesthetic parameters do not cause health problems but can reduce the palatability of water when found in excess. The maximum levels are set according to the maximum tolerance of the general public, before an aesthetic problem may be perceived.

Table 2: Aesthetic Parameters - Exceedence of Guidelines and Potential Effects

Parameter	M.O.E. Criteria	% of Supplies Exceeding Criteria	Potential Water Quality Effects
Chloride	250 mg/L	9	Salty taste, may be corrosive to plumbing
Iron	0.3 mg/L	36	Rust or black stains on fixtures and laundry
Manganese	0.05 mg/L	41	Metallic Taste
Turbidity	1 Formazin Turbidity Unit	63	Cloudy Water
Colour	5 Hazen Units	71	Self-Explanatory
Sulphate	250 mg/L	0	Water may have a Laxative effect

In this survey, levels of iron, manganese, and turbidity and colour were above the Ministry's criteria in a large percentage of supplies (36-71%), but they were not unanimously perceived by the residents as being problematic. Only 25% of the residents interviewed described their water as being fair to poor in quality, while 75% described it as being good to excellent.

Only 2 supplies were considered to be sufficiently unpalatable, due to aesthetic parameters, to prompt the residents to turn to alternate supplies, for drinking purposes.

6.2.3 Water Quantity

Water quantity problems were reported by a significant proportion (24%) of residents interviewed. Most of the residents who complained of water shortages also practiced careful water management. Of the supplies which did not provide adequate quantities of water, the great majority (88%) were dug wells, with only a few (12%) drilled wells being inadequate. Significant relationships between low water yield and contamination were determined. At least half of the wells which experienced quantity problems, also experienced bacterial contamination and/or above background nitrate contamination.

The problem with dug wells in the Wahnapitae area is that there are few good locations for them, due to the great predominance of rock outcrops, and the shallowness of the soil mantle. Further, the soil material is fine sediment or clay, both of which are of low porosity and permeability, thus not usually providing a good yield or storage of water.

Many residents had more than one well making up their supply. They were thus able to alternate from one well to the other or use one to supplement the other. This system apparently corrected quantity problems in some cases. Other residents attempted similar measures but met with little

success. Two residents in the western section of the survey area attempted a number of drilled and dug wells, but did not succeed in attaining a plentiful source of water.

Three shared wells were not reported as having quantity problems and were not included in the computation of the 25 wells experiencing shortages. However, shared wells are not the most appropriate method of providing a secure supply. Changes in property ownership can result in the termination of supply for the residents who do not own the property rights to the well. The optimum situation is that each residence has its own water supply.

7.0 CONCLUSIONS

The Wahnapitae East area is established on rough terrain, consisting of a large expanse of rock outcrops, with a sparse quantity of poor quality soils. This type of terrain is not conducive to the disposal of sewage via private systems, nor to the yield of large quantities of water through the use of dug wells.

It is for these reasons, that the area experiences the following water-related problems and the potential for sewage disposal problems:

(1) A large percentage (25%) of dug wells in the Wahnapitae East area were found to be bacterially contaminated.

(2) Twelve wells were found to have elevated levels of chlorides or nitrates. The source of chloride contamination is suspected to be winter road maintenance activities on Highway 17.

(3) Twenty-five residences did not have a sufficient supply of water for normal household uses. A strong correlation existed between those wells experiencing quantity problems and those experiencing bacterial and low level nitrate contamination.

(4) A total of 54 residences were affected by bacterial, chemical and/or quantity problems.

(5) The great majority of water quality and quantity problems were found to occur in dug wells. The most desirable corrective measure in most cases is the installation of a drilled well properly cased in bedrock.

(6) Although only a few sewage disposal system problems were found at the time of the study, the potential for problems in this area is large.

If an adequate water supply is provided to homes in this area, a large increase in water usage is expected. This factor, in conjunction with the rectification of grey water disposal procedures, could potentially result in many sewage disposal problems. Residences which are subject to these improvements, should also be eligible for correction to the sewage disposal system, should this necessity arise.

List of Appendices

Appendix B

1982 04 05.

Dear Sir:

Re: Wahnapitae East - Private Funding Survey

The Ministry of the Environment is presently conducting a residential well water and sewage disposal survey in the Wahnapitae East area. When staff called at your home, you were not available for comment.

Please call 675-4501 to arrange a re-visit.

Yours very truly,

CJL/vll/6868

C. J. Lafrance,
Environmental Officer.

Appendix C

List of Wahnapitae East Survey Residents/Owners

Survey #	
W-1	P. Dupuis
W-2	F. Battams
W-3	A. Dempsey
W-4	E. Dempsey
W-5	Sauve - owner F. Battams
W-6	H. Dempsey
W-7	L. Dempsey
W-8	M. Julian
W-9	D. Dempsey
W-10	M. Courtemanche
W-11	A. Hurd - owner Wahnapitae Lumber
W-12	G. Hurd - owner Wahnapitae Lumber
W-13	resident not reached
W-14	V. Guindon
W-14A	M. Dore - owner V. Guindon
W-15	Y. Drapeau
W-16	A. Vandruenan
W-17	E. McCormick
W-18	A. Lavoie
W-19	G. Molyneaux
W-20	V. McCormick
W-21	Y. Sabourin - owner G. Ranger
W-22	G. Clouthier
W-23	G. Raymond
W-24	J. Frappier
W-25	S. Michaud
W-26	V. Julian
W-27	I. Talbot - owner R. Silvestry
W-28	W. Savard
W-29	B. Lecuyer
W-30	E. Lamirande
W-31	F. Foley
W-32	not a residence
W-33	not a residence
W-34	L. A. Cayer
W-35	Vacant
W-36	J. Pelland - owner R. Goudreau
W-37	Lise Cayer - owner C. Bergeron
W-38	L. Laurendeau - owner C. Bergeron
W-39	1981 Lise Cayer - owner C. Bergeron 1982 new resident
W-40	1981 R. Yougn - owner B. Spencer 1982 N. Poitras
W-41	M. St. Louis - owner C. Lafond
W-42	vacant
W-43	W. Gervais
W-44	T. Chamberlain - owner Mr. Linch
W-45	A. Charlebois - owner Mr. Morrison
W-46A	O. Rivet
W-46B	Therese Rivet
W-47	A. Bibeau
W-48	A. Brisson
W-49	D. Laskin
W-50	L. Lalonde

W-51	H. Pacaud
W-52	L. Lamothe
W-53	R. Rienguette
W-54	D. Lamothe
W-55	R. Lamothe
W-56	vacant
W-57	R. Lafontaine - owner P. Foley
W-58	B. Landry
W-59	Y. Pilon
W-60	Ted Rienguette
W-61	K. Switzer
W-62	S. McLean
W-63	P. Prince
W-64	Theodore Rienguette
W-65	H. Larocque - trailer park owner
W-66	Dora Antler
W-67	B. Dempsey - owner D. Antler
W-68	M. Savignac
W-69	E. Prevost
W-70	R. Beaudry
W-71	G. Beaudry
W-72	J. Field
W-73	no corresponding residence
W-74	P. Turgeon
W-75	C. Fetterly
W-76	O. Kummetat
W-77	N. Prudhomme
W-78	R. McCormick
W-79	A. Roy
W-80	G. Laurin
W-81	M. Roy
W-82	M. Labrosse
W-83	R. Martin
W-84	W. Charron
W-85	G. Roy
W-86	B. Jacobson
W-87	G. Brown
W-88	E. Guindon
W-89	N. Prosser
W-90	L. Richer
W-91	R. Marcotte
W-92	H. Rupert
W-93	H. Allen
W-94	J. Smith
W-95	G. Pilon
W-96	1981 F. Wendorf - Wahnapitae Lumber 1982 R. Hood
W-97	P. Joudrey
W-98	R. Lafond
W-99	A. Clement - owner J. Clement
W-100	J. Clement

W-101	A. Dagenais
W-102	M. Wasylenki
W-103	Vacant Store
W-104	A. St. Martin
W-105	V. Diotte - owner R. Berard
W-106	I. Fram
W-107	A. Fram
W-108	E. Fowler
W-109	Vacant School
W-110	L. Julian - owner S. Smithson
W-150	I. Rochon
W-151	B. Duhamel (not within survey boundaries)
W-152	not on map
W-153	O. Bedard
W-154	L. Carlson
W-155	K. Ferron
W-156	A. Bedard

Summary

Total Number of Catalogued Establishments/structures	117
No. of Vacant Establishments	5
No. of Structures not Residences or Commercial Establishments	4
No. Out of Survey Boundaries	1
No. Not Reached	1
Total No. of Residences Included in Survey	106

Appendix D

Sewage System Information

TYPE			AGE			TOTALS
Class 1			Unknown			2
Class 4	Unknown	0-5	6-10	11-15	15+	
Metal Construction	-	4	20	16	7	47
Concrete Construction	1	7	14	12	6	40
Unknown Construction	3	2	3	-	2	10
Class 5						
Metal		1			1	2
Unknown		1			1	2
Unknown	1					1
						104*

* Two systems are shared

Greywater Discharge

To Surface	19
To Leaching Pit	6

Appendix E

Water Supply Information

Type	No.	%	Avg. Depth (m)	Bacterial Contamination No.
Dug Well	57	56	6.7	14
Drilled Well	34	34	45	7
Sand Point	1	1	?	-
Surface Water	8	8	-	-
Unknown	1	1	-	-
TOTAL	*101	100	-	22

* 5 systems are shared

Age of Wells

	0-5	6-10	11-15	15+	Unknown
Dug	9	13	14	15	7
Drilled	10	7	12	7	-
Sandpoint	-	-	-	-	1
Communal Surface Water System		1			

Appendix F

Consumer Well Complaints

Aesthetics		No.	%
Taste		13	12
Odour		15	14
Colour		11	11
Hardness		39	37
Iron		39	37
Overall Quality Rating	- Excellent - good	79	75
	- Fair - poor	26	25

Quantity	
Regular severe shortage	14
Dry summer shortages	8
Careful water management	3
Shared Wells	6
Total Quantity Related Complaints	31

Water Treatment Utilized

Filter	1
Softener	1
Boil	1
Total	3

Appendix G

Summary of Exceedences of M.O.E. Drinking Water Quality

Parameters with Established Criteria	M.O.E. Drinking Water Quality Criteria	% of Supplies Exceeding Criteria
Iron	0.3 mg/L	36
Chloride	250 mg/L	9
Colour	5 Hazen Units	71
Turbidity	1 Formazin Unit	63
pH	6.5 - 8.5	4
Sodium	[1.] 20 mg/L	41
Manganese	0.05 mg/L	41
Nitrate	10 mg/L	3
Sulphate	250 mg/L	0
Fluoride	1.2 mg/L	0
Copper	1.0 mg/L	0
Zinc	5.0 mg/L	0
Chromium	0.05 mg/L	0
Cadmium	0.01 mg/L	0
Lead	0.05 mg/L	0
Arsenic	[2.] 0.025 mg/L	0

1 - Notification Level

2 - Northeastern Region Correction Level

GLOSSARY OF CHEMICAL TERMS

1. Alkalinity

Alkalinity is the measure of the power of a solution to neutralize hydrogen ions. It is used to define the buffering capacity (the capacity to resist changes in pH) of water. It is the result of the presence of carbonates, bicarbonates, and hydroxides. It is generally associated with high pH values and hardness and is expressed in terms of an equivalent amount of calcium carbonate. Alkalinity is not considered detrimental to human health.

2. Colour - Apparent

Apparent colour includes colour due to dissolved solids and suspended matter. In groundwaters colour is usually due to the presence of iron, manganese or dissolved organic matter. Most naturally coloured water (usually yellowish-brown) is harmless.

3. Chloride

Chloride concentrations in water supplies may result from contact with minerals, industrial and agricultural wastes, or human and animal sewage. Land drainage often contains high concentrations of chloride in the winter due to the

application of road salt. Chlorides are not harmful, but do produce a salty taste. The allowable concentration in drinking water is based on taste rather than on health considerations.

4. Conductivity

Conductivity is defined as the reciprocal of a water's electrical resistance. It is a measure of the ion concentration in water. In natural waters, conductivity is mainly due to calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulfate, and nitrate ions. It is not considered a health hazard.

5. Hardness

Hardness is traditionally a measure of the soap neutralizing power of water, expressed in terms of an equivalent concentration of calcium carbonate. Hardness is mainly attributable to the presence of calcium and magnesium ions resulting from the natural accumulation of salts during contact with soil and geological formations. Excessive hardness (>200) is considered objectionable because it reduces the efficiency of soap and it can also produce scums on water surfaces and cause clogging in the plumbing system.

6. Iron

Iron is the most abundant of the heavy metals found in nature but despite this abundance it is generally found in relatively low concentrations in uncontaminated surface waters. In groundwater, however, conditions may be such that high concentrations of iron remain in solution. Iron concentrations occur in water due to the leaching of soluble iron salts from soil and rocks. Iron is non-toxic even at high concentrations but becomes objectionable because of the taste, odour and colour it imparts to the water. It also tends to stain laundry and porcelain plumbing fixtures. Ferric iron can combine with the tannin in tea to produce a dark violet colour.

7. Manganese

Manganese is a common element in nature and found in numerous minerals. It is essential in trace quantities for the proper nutrition of both plants and animals. Manganese is non-toxic at levels encountered in water supplies. It can cause unpleasant tastes and stain laundry and plumbing fixtures. Iron and manganese are commonly found together.

8. Nitrate Nitrogen

Nitrates are the end products of the oxidation of organic nitrogen and as such they occur in polluted waters that have undergone self-purification. They can occur in groundwater as a result of seepage from sub surface sewage disposal systems or leaching of fertilized soil. Although nitrates are considered non-toxic to adults, high levels (in excess of 10 mg/L) in domestic water supplies, can lead to a condition known as infant methemoglobinemia in which the oxygen carrying capacity of the blood is inhibited. This illness is most prevalent in children under the age of 3 months and possibly in pregnant women.

If nitrates are above the recommended limit and family members are within the age groups and conditions mentioned above, the consumer should contact his/her family physician.

9. pH

pH is a parameter which expresses the basicity or acidity of a solution. There is no direct health effect on which to base limites for the pH of drinking water. A pH of 7 is neutral, water of high pH (above 8.5) is considered basic and may cause incrustations in pipes and plumbing fixtures. Water of low pH (below 6.5) is considered acid and may cause metal corrosion of pipes. The recommended limits (6.5 - 8.5) for drinking water are thus devised to reduce these processes.

10. Sodium

Sodium ranks sixth in the natural order of elemental abundance and is normally the principal ion in brackish or saline groundwater. It is important for all life forms and is generally considered non-toxic. Patients with renal, cardiac and circulatory problems however are usually warned to avoid the consumption of water containing high concentrations of sodium. Waters softened by the ion-exchange process, employed in most domestic water softening equipment, generally contain high levels of sodium.

11. Sulphates

Sulphates occur naturally in water as a result of leachings from minerals and biological processes. Water high in sulphates tends to form hard scales on plumbing and increase the corrosiveness of water towards concrete. Under certain conditions high sulphates may promote a non toxic bacterial growth which converts the sulphate ion to hydrogen sulphide gas imparting rotten egg smell to the water. Concentrations which exceed the recommended limit may exert an effect similar to a laxative on the gastro-intestinal tract.

12. Turbidity

Turbidity is caused by suspended matter which diminishes the the penetration of light and makes the water appear cloudy. It is an aesthetic parameters and not usually associated with health related problems. However, excessive turbidity can interfere with disinfection processes, especially when using chlorine compounds as the disinfectant. In Ontario, turbidity is measured in Formazin Units.

13. Fluoride

Fluorides occur naturally in minerals and soils and are thus present in varying concentrations in well water. Trace amounts of fluorides present in drinking water provide a substantial protection from dental cavities, especially for children. Fluoride levels much in excess of the recommended limits may lead to mottling of teeth. The limit has been set on the basis of these enamel effects.

Appendix A:

Wahnapitae East Survey Boundaries Dryden Twp. «1982»